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No. 9

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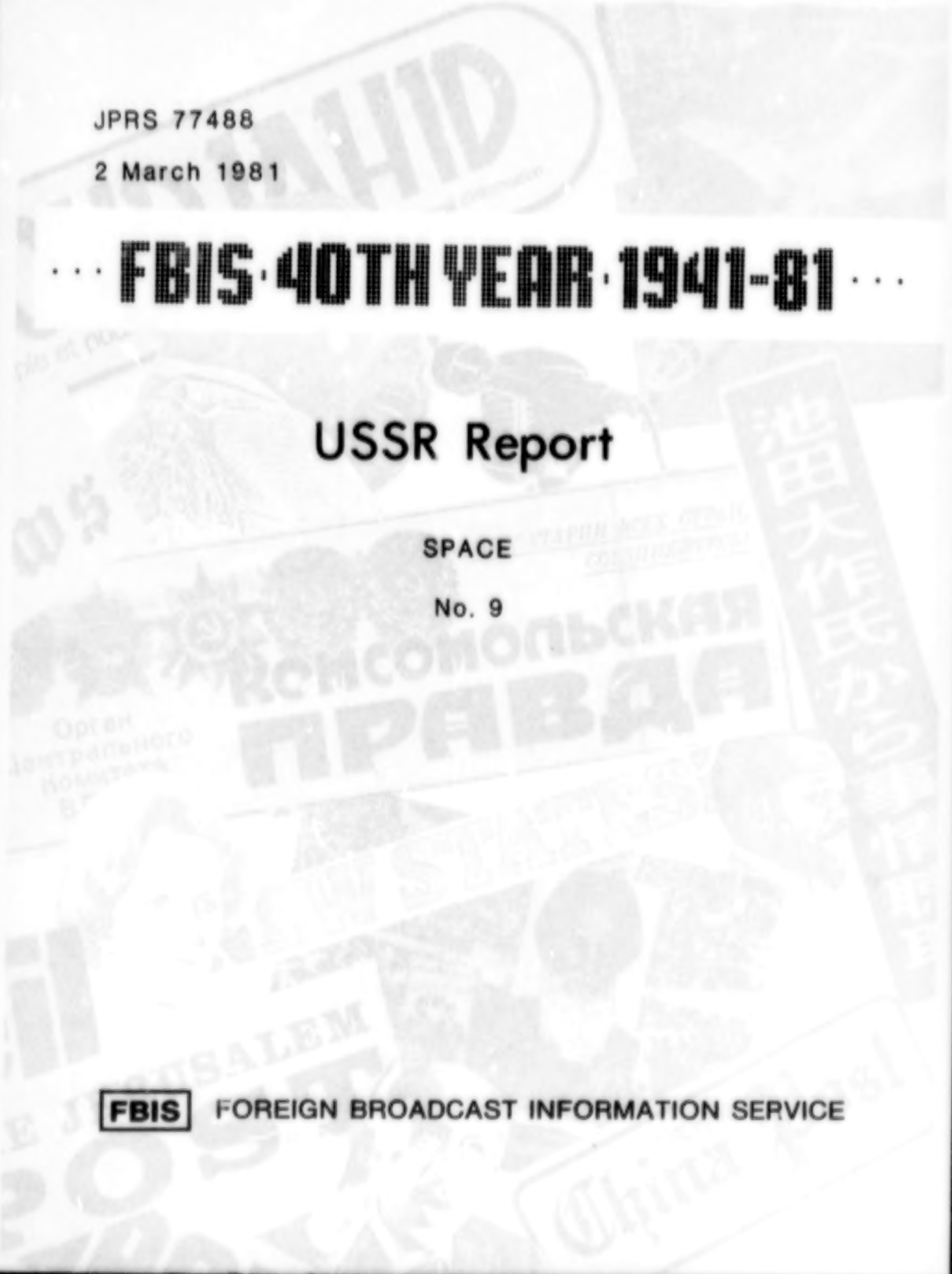

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On behalf of all of us in FBIS I wish to express appreciation to our readers who have guided our efforts throughout the years.

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MANNED MISSION HIGHLIGHTS

CHRONOLOGY OF SOYUZ T-3 MISSION

[Editorial Report] The Soviet News Agency TASS reports the following information on activities connected with the flight of "Soyuz T-3":

27 November--At 1718 hours Moscow time the three-man "Soyuz T-3" spacecraft was launched with a crew consisting of flight commander Lt Col Leonid Denisovich Kizim, flight engineer Oleg Grigor'yevich Makarov and cosmonaut-researcher Gennadiy Mikhaylovich Strekalov. The mission of the flight is to further test the "Soyuz-T" series spacecraft in autonomous flight and in joint operation with the "Salyut-6"--"Progress-11" complex. [Moscow TASS in English 1727 GMT 27 Nov 80]

28 November--At 1854 hours Moscow time the "Soyuz T-3" docked with the "Salyut-6"--"Progress-11" complex and the three cosmonauts transferred to the station. The crew's work program includes:

--further testing of the "Soyuz T-3" ship;
--checkout of the "Salyut-6" station and performance of necessary maintenance and repairs;
--scientific-technical studies and experiments.
[Moscow TASS in English 1938 GMT 28 Nov 80]

29 November--The crew's second working day began at 1200 hours Moscow time. Work was begun on activating the station and checking its systems. Experiments were initiated to study development of biological objects brought to the station by the "Soyuz T-3" craft.
[Moscow TASS in English 1055 GMT 29 Nov 80]

2 December--The cosmonauts continue to check "Salyut-6" systems. Preparations have been completed for repair of the station's heat regulation system. On 1 December an experiment was begun with the "Splav" unit to obtain a cadmium-mercury-tellurium semiconductor compound. In the afternoon of 2 December a materials study experiment will be started with the "Kristall" apparatus. Parameters of the station's living quarters are being measured in the course of the "Mikroklimat" experiment.
[Moscow TASS in English 1105 GMT 2 Dec 80]

4 December--The crew has started repairs on the control system of the onboard complex. Repairs are being performed on the temperature telemetry system. The station's refueling system will be tested later today. Two experiments have been performed on the "Kristall" furnace to obtain a gallium-bismuth semiconductor

material. Experiments on development of plants in the "Oazis" and "Svetoblok" hothouses are continuing. [Moscow TASS in English 1145 GMT 4 Dec 80]

5 December--Yesterday the crew used a tool set available on the station to replace electronic units in the station's telemetry system. The work plan for 5 December calls for the crew to locate and repair electrical faults in the station's electrical supply system. The "Splav" experiment begun on 1 December has been completed. A check of the flight commander's cardiovascular system will be performed today. [Moscow TASS in English 1144 GMT 5 Dec 80]

8 December--The flight of the "Soyuz T-3" crew is nearing completion. The cosmonauts are preparing the station for unmanned operation and transferring equipment and experimental materials to the descent module of "Soyuz T-3". An orbital correction powered by the "Progress-11" freighter is scheduled for this afternoon. [Moscow TASS in English 1147 GMT 8 Dec 80]

9 December--The "Soyuz T-3" cosmonauts are scheduled to return to earth Wednesday, 10 December. The cosmonauts are checking the "Soyuz T-3" ship and carrying out final operations. At 1323 hours Moscow time the "Progress-11" freight ship was undocked. After yesterday's orbital correction maneuver the orbital parameters of the "Salyut-6"--"Soyuz T-3" complex are:

--apogee, 370 km;
--perigee, 290 km:
--orbital period, 90.8 min;
--inclination, 51.6 degress.
[Moscow TASS in English 1238 GMT 9 Dec 80]

10 December--After successfully accomplishing their mission the "Soyuz T-3" cosmonauts returned to earth at 1226 hours Moscow time on 10 December. The descent vehicle touched down in the pre-set area 130 km east of the city of Dzhezkazgan. During the flight the crew performed a number of repair and maintenance operations on the "Salyut-6" station:

--a new hydraulic unit with four pumps was installed in the temperature control system;
--an electronic unit in the telemetry system and a program and timing device in the onboard control system were replaced;
--a new transducer for compressor power supply was installed in the station's refueling system.

The crew received advice in communications sessions with experts on the ground including cosmonauts Popov and Ryumin, the previous "Salyut-6" crew. Tests have shown that following the work carried out by cosmonauts Kizim, Makarov and Strekalov the onboard systems of the "Salyut-6" station can ensure further active functioning of the station in orbit.
[Moscow TASS in English 1130 and 1147 GMT 10 Dec 80]

[36-F]

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SOVIET COSMONAUT TRAINING CENTER REVIEWED

Moscow ZEMLYA I VSELENNAYA in Russian No 5, 1980 pp 15-19

[Article by Chief of the Cosmonaut Training Center imeni Yu. A. Gagarin, Twice Hero of the Soviet Union, Cosmonaut-Pilot of the USSR G. T. Beregovoy]

[Text] The principal and backup crews of one, two and three cosmonauts have been trained here for 20 years. These are the crew commanders and flight engineers and the cosmonaut researchers. By 12 April 1980, 40 crews had completed space flights. They included 46 Soviet cosmonauts and 4 cosmonauts from socialist countries. Five cosmonauts made three flights, 16 made two, and 28 made one.

An enormous amount of work and the solution of complex scientific, technical and organizational problems are hidden behind these indexes. The cosmonauts are trained for the flights in four basic areas: preparation for the spacecraft control and operation and maintenance of the on-board service systems, training in the testing of space equipment and the performance of scientific experiments and studies in space, preparation of the organism of the cosmonauts for the effects of space flight factors, and the moral-political and psychological training.

The first space flights of man had to answer one question: is it possible to live and work in space? For this reason, the conditioning of the organism of the cosmonauts for the effects of weightlessness, G-loads, and rolling had defining significance. Wide use was made of the thermobaric chamber, centrifuge and anechoic chamber.

As data were obtained, the old training methods and technical means were corrected or new ones were developed. Thus, for example, after it was discovered that during adaptation to weightlessness the blood runs to the cosmonaut's head, new methods of ground conditioning of the organism to generate compensating reactions were developed, and on-board devices were built to decrease the rushing of the blood to the head.

After the first long flight it turned out that the organism adapts with difficulty to the earth's gravity. The specialists developed effective methods and means facilitating the return of the cosmonauts to the earth's gravity. Now we have a set of means and methods of both preflight training of the cosmonauts and conditioning of the cosmonauts during the flight insuring safe transition from weightlessness conditions to the earth's gravity. The excellent health of the participants in the long expeditions on the "Salyut-6" station is evidence of this fact (ZEMLYA I VSELENNAYA, No 1, 1979, pp 17-21 -- Ed.).

As the conquest of outer space was made by manned spacecraft, the goals and the problems of professional mastery of the cosmonauts changed. The functions of the crew were expanded and became more complicated from one flight to the next. The training process also became more complex.

At the present time two phases are recognized in the cosmonaut training: the general space training phase and the space flight (direct) training phase (ZEMLYA I VSELENNAYA, No 2, 1978, pp 5-10 -- Ed.).

The general space training is done in groups of cosmonaut trainees by a common program. The crews have still not been formed in this phase. The purpose of the general space training is acquisition of occupational skills and qualifications. At the same time individual characteristics of the cosmonauts are studied. During the formation of future crews it is necessary to consider the criteria of mutual psychological compatibility.

In the first phase a study is made of the general theoretical disciplines (the principles of structural design of the manned spacecraft, the principles of building the spacecraft control systems, and so on). The cosmonaut candidates -- test pilots and future crew commanders -- also are qualified as test pilots if they have not already been qualified.

The necessity has now come for reexamination of the general space training goals. Its predominantly technical slant justified in the initial phase of practical cosmonautics does not now correspond to the goals of today's space flights. A greater and greater role has come to be played by work in the field of astronomy, geology, agriculture, forestry, and the fishing industry. As a result of the shortage of time, it is complicated to master the required methods of performing this work in the phase of direct training of the crews for specific flights. The cosmonaut must acquire this knowledge beginning with the general space training.

The direct training is done with crews formed before each flight for a specific spacecraft and by a defined program. In this phase the primary goal is education of the cosmonauts in the skills of controlling, operating and maintaining the spacecraft and station on which the flight will be completed, the determination of the course of action in unforeseen situations and interaction with the ground services of the flight control center. The cosmonaut must master the procedure for performing experiments and research included in the flight program.

Let us consider some component parts of the space flight training.

The flight and parachute training, it would appear, must be mandatory. However, there were opponents of flight training for cosmonauts. And, indeed, everything was not clear to the proponents of it: which types of aircraft to fly? How many hours must be flown and when? What habits must be instilled and which can be harmful? Research was required by specially developed procedures and programs before it was possible to answer all of the questions. Now the content and the procedure for this training are substantiated. The flights on the aircraft and parachute jumps help shape the professional testing qualifications in the cosmonauts which are required for making space flights: effectiveness of thinking, emotional stability, psychological readiness for action under complex flight conditions, the capacity to tolerate the effects of space flight factors.

The technical training is the most important and voluminous process. The crew must know the equipment to be used on the upcoming flight forwards and backward. With the years it has become clearer and clearer what the cosmonaut must be taught about the structural design of the space ship or station, in what detail he must know one system or another, and how to evaluate the quality and depth of knowledge. There are also many difficulties here of a different nature. The crew begins training when the ship or station is still in the development or manufacturing stage. There are still no training documents, only the operating ones. The developers of the various systems and the procedural engineers help the crews.

Many years of experience have helped to develop various forms of training. These include lecture and seminar exercises, independent study, participation in the testing of individual systems and complex testing of spacecraft (stations) at the manufacturing enterprises and at the cosmodrome.

The training sessions on the complex and specialized trainers help the cosmonauts learn how to operate the spacecraft (station) systems and perform all operations provided for by the flight program.

The main problems connected with this type of cosmonaut training are the following: insurance of complete correspondence of the training operations to the activity the cosmonaut (crew) will be engaged in in-flight; estimation of the quality of performance of the training operations by the cosmonauts (crew), the creation of extraordinary or emergency situations on the trainer which can arise on a real flight and evaluation of the crew behavior in the situation, and the development of the principles of building trainers and training complexes.

Along with the development of the system of complex and specialized trainers, a great deal of attention is given to the creation of means permitting simulation of some of the physical conditions of space flight. Reproduction of weightlessness conditions is exceptionally important for preparation for the performance of experiments and research in space. It is possible under weightlessness conditions to work out how the cosmonauts will move with loads, take space walks, and perform installation, dismantling and repair work. The method of prolonged training under simulated weightlessness in a hydraulic medium has been substantiated and developed. An ordinary swimming pool was first used for this training.

At this time a special hydraulic laboratory has been built which is equipped with a telemetric measuring complex for data pickup, transmission and processing and also equipment for movie, photographic and television surveys. A pool about 24 meters in diameter and 12 meters deep permits the installation of models of the "Salyut" station and the "Soyuz" space ship in the docked position.

For short-term reproduction of weightlessness, aircraft laboratories are used on which weightlessness occurs under defined flight conditions for 20 to 25 seconds. The Uti-MiG-15 and Tu-104 laboratory aircraft were used for a long time for this purpose. Now the Center has the Il-76 laboratory aircraft available.

Their main cabin has a volume of about 400 m^3. Training objects weighing up to 6 tons can be placed in it. The aircraft is equipped with a technical and medical data pickup and recording system.

The means of creating G-loads (centrifuges) have great significance in training of cosmonauts and developing space engineering. They were used when training cosmonauts for the first flights, and they are still used today.

A space planetarium has been put into operation for familiarization with space navigation and also for developing scientific research procedures using the heavenly bodies. It provides for exact reproduction of about 900 stars and constellations of the entire celestial sphere, the movement of the sun, the moon and the planets. The horizon in the space planetarium is 15° below the earth's horizon.

Until comparatively recently, the space trainers were built as independent autonomously functioning devices. Each of them has its own computer, its own system for simulating the visual situation, and its own control panel. With an increase in the number of trainers, this principle became economically and technically disadvantageous.

As a result of the analysis performed by the specialists of the Center jointly with the institutes of the USSR Academy of Sciences, other institutes and design offices, it was proposed that the transition be made to a theoretically new base for construction of a complex of technical training facilities based on general, collective systems and subsystems (computer systems, information systems, and so on) capable of providing for simultaneous operation of a significant number of trainers, full-scale mockups and stands.

Computer and information engineering permit the simulation of extraordinary and emergency situations, operative development of recommendations to the crew, how to act in such situations, objectively to monitor the degree of training of the crew and its readiness for flight, automated planning and control of cosmonaut training.

Serious attention is given in cosmonaut training to the development of a procedure for performing scientific and applied experiments and research. The volume of acquired knowledge increases from year to year in connection with an increase in the length of the space flights and an increase in the proportion of the work, the results of which are used in the national economy in their programs. Now the high scientific and cost effectiveness of studying the earth by space methods has become indisputable. The future lies with these methods. Therefore the problems of cosmonaut training for the execution of applied national economic operations are unavoidably becoming more complicated. These problems are divided into two categories -- scientific-procedural and organizational. In the current phase, the organizational aspect of the problem is more complex. The fact is that the studies of the earth from space are essentially complex. One crew in the same unit will work for many branches of the national economy. Only the information to the user will have to be different. The difference in the departmental interests must not have a negative influence on the cosmonaut training. It is necessary to combine both the experiments performed on board themselves and the preparation for them into complexes. We have already accumulated some experience in the complex training of crews for performing operations of interest to the "Priroda" Gostsentr [State Center], specialists in agriculture and fishing.

The increase in volume of research and testing work in space, the increase in flight duration, the international nature of many of the flights require constant improvement of the moral-political and psychological training of the cosmonauts. The moral-political factor plays the most important role in successful solution by the cosmonauts of the problems with which they are faced.

When organizing the moral-political and psychological training for space flights the initial material is the principles of Marxism-Leninism on the dialectic relation of man and machine, the instructions of the CPSU regarding the fact that cosmonautics must serve the solution of social goals and class problems. Beginning with this fact, a complex approach has been developed to the education and training of cosmonauts, preparation of them for the flights. Only man, with profound understanding of the social meaning and significance of his work and skillfully mastering machines, is capable of making full use of their capabilities.

PHOTO CAPTIONS

1. p. 16. Training mockup of the "Salyut" orbital station.

2. p. 16. Centrifuge used in the initial period of cosmonaut training.

3. p. 17. Complex "Soyuz" space ship trainer.

4. p. 17. Weightlessness cabin of the Il-76 aircraft.

5. p. 18. Space planetarium.

6. p. 19. Cosmonaut-pilots of the USSR A. V. Filipchenko and N. N. Rukavishnikov work out the water landing operations.

7. p. 19. In an extraordinary situation it is also possible to land in the desert.

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EVOLUTION OF THE SOYUZ SPACECRAFT

Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 10, 1980 pp 38-39

[Article by Colonel Yu. Malyshev, hero of the Soviet Union, pilot cosmonaut of the USSR]

[Text] When Vladimir Aksenov and I tested the "Soyuz T" series spacecraft in outer space in June of this year in the manned version, we were engaged in the development of its new on-board systems and equipment. We not only admired its improvements and significant difference from its predecessor, but were astounded by the farsightedness of S. P. Korolev and other designers who in the very first "Soyuz" were able to lay the foundation for the potential to develop this spacecraft considering the constant complication of the problems of cosmonautics.

The creation of the "Soyuz" spacecraft in the second half of the 1960's marked a new phase in the development of manned spacecraft. The planned and purposeful conquest of outer space at that time required a space program, the implementation of which would provide for the creation of an orbital station. A large number of theoretically new important problems had to be solved on the way to this goal. For this, a multipurpose, base spacecraft was required which would facilitate and decrease the cost of building the new space system, would become the base for assembling an orbital station, and for the organization of supply for this station and would simultaneously permit continuation of further studies of outer space. The new spacecraft had to provide for broad maneuvering in space, docking with other spacecraft, prolonged flights to study the effect of space flight factors on the organism of man, the implementation of a broad scientific research program and the development of new navigation and control systems.

Such a spacecraft was built. It was the "Soyuz." It combined the elements of a transport ship and an orbital station.

Let us remember the basic structural peculiarities and distinctions of the "Soyuz" from its predecessors -- the "Vostok" and the "Voskhod."

The spacecraft has two working compartments. The cosmonauts' cabin or reentry module where the crew is located on insertion into orbit and return to earth, is located in the central part of the spacecraft. The orbital module is adjacent to it on one side, and the on-board system section, on the other.

The orbital module is an auxiliary facility which can be used for research and performing experiments. When necessary it performs the role of an airlock for the cosmonauts to take space walks.

In the nose of the spacecraft, in the orbital module, there is a docking unit for rigid mechanical coupling of spacecraft and their electrical circuitry. Its structural design provides for opening of the hatches after docking and transfer of the cosmonauts from one spacecraft to another.

When the "Soyuz" spacecraft participates in autonomous flights, solar cell panels are installed in the on-board systems section. If the "Soyuz" is used as a transport ship, these panels are left off.

For performing maneuvers in orbit and for reentry the "Soyuz" is equipped with a liquid-propellant rocket power plant including two engines with a thrust of 400 kgf each.

In contrast to the "Vostok" and the "Voskhod," which reentered the atmosphere in ballistic trajectories, as a result of which the cosmonauts experienced a G-force of 10 G's on the "Soyuz" controlled reentry is used. For this purpose the reentry vehicle has aerodynamic qualities. The maximum G-loads during movement of the vehicle in the atmosphere were almost cut in half. It is an axisymmetric body resembling an automobile headlight and moving with the blunt part forward during reentry. Its lift arises from the shift of the center of mass of the vehicle from the axis of symmetry as a result of the structural elements and location of equipment.

Having such a spacecraft, in only 10 years after launching Yu. Gagarin, we have resolved all the problems connected with creating a long-term orbital station. The application of the same spacecraft for different purposes has reduced the time, facilitated and reduced the cost of developing a new space system.

What was the further fate of the "Soyuz"?

After creation of the orbital stations, autonomous flights of these spacecraft became rare. Therefore the basic version of the "Soyuz" today is the transport ship. Crews are delivered to the orbital station and returned to earth on board this space ship.

Inasmuch as the transport "Soyuz" was not designed for prolonged independent flight, it is only equipped with chemical sources of electric power and a life-support system with less capacity. It is possible to insert a small payload (to 50 kg) into orbit along with the cosmonauts.

Depending on its purpose, the "Soyuz" is used in the single-seat, two-seat and three-seat versions. If it is designed for docking with other spacecraft, a docking unit is installed in the forward crew compartment. The majority of the launched "Soyuz" spacecraft were built in this version. During experimental flight of the "Soyuz-19" and "Apollo" spacecraft, it had a specially developed androgynous peripheral docking unit.

When testing the multizonal MKF-6 photographic system built by specialists of the USSR and the German Democratic Republic on "Soyuz-22" a special photography compartment was installed instead of the docking unit.

During the operation and maintenance of long-term orbital stations, the urgent problem arose of the creation of an"earth-orbit" cargo bridge. The "Progress" unmanned cargo space ship was developed on the basis of the "Soyuz." Its basic differences arose from the fact that it operates in the automatic mode and is not designed to return to the earth. It delivers 2 to 2.3 tons of cargo into orbit.

The experience in the long-term, varied operation of the "Soyuz" has stimulated research and inspired design concepts. Each launch of the spacecraft has enriched its developers with something new. They have always wanted to adjust something, to make it better.

However, it is always very difficult to introduce improvements in a series vehicle. Nevertheless, the time came when modification of the "Soyuz" became inevitable. It took the shape of a major alteration of the spacecraft. Externally it was altered little, but internally, quite significantly. Many of the mechanisms and almost all of the instruments were replaced. The radio communications and heat control systems were improved; there were new orientation systems, new systems for controlling movement and the on-board complex and also there were new power engineering and life support systems. The ship was equipped with an on-board computer complex and an integrated propulsion unit.

Previously, overconsumption of fuel in the orientation system of the spacecraft threatened curtailment of flight and return of the crew to the earth, although there was still excess fuel for operation of the main propulsion engine. Now the main propulsion engine and the orientation and docking engine are powered by the same fuel from common tanks. This offers the possibility of redistribution and more efficient use of the fuel and improves the handling characteristics of the spacecraft.

On the "Soyuz" spacecraft that have flown up to now, the crew quarters and instrument bay were jettisoned after development of the braking thrust when the spacecraft was on the descent trajectory. In the "Soyuz T" spacecraft the crew quarters compartment is jettisoned while it is still in orbit. This is done so as not to waste fuel on braking the unnecessary compartment which is in any case going to burn up in the atmosphere.

In addition to the chemical sources of current (batteries) on the "Soyuz T" spacecraft the solar cell has reappeared in the form of two wings. After docking with the station it is included in the united electric power supply system of the orbital complex.

The changes introduced into the structural design of the spacecraft have made it possible to increase its margin of strength and reliability.

The soft-landing engines located on the bottom of the reentry vehicle have greater thrust, which lowers the landing speed and, consequently, provides more comfortable conditions for return of the cosmonauts to the earth.

The on-board computer complex assembled from integrated circuits having high speed and sufficient memory size can be called the "electronic brain" of the spacecraft. It takes on the most difficult and least creative work. Programmed turns, the settings for switching on the main propulsion engine, the docking and orientation engines both during rendezvous and docking with the station and in autonomous flight are calculated by the algorithms stored in its memory banks. The "electronic brain" also controls the movement of the spacecraft on the descent segment.

As a result of the on-board computer the spacecraft has become more independent. It does not need constant ground control. Many calculations which previously were performed by the ground computer centers now are performed directly in orbit. This means that the decisions regarding the required maneuvers of the spacecraft can be made much more quickly.

The "electronic brain" depicts information on the display screen about the operation and the condition of the on-board systems and the position of the spacecraft in space. These data are simultaneously transmitted to the ground by television. The value of this information is especially great when the situation changes quickly in flight and immediate well-substantiated decisions are required of the crew. Such a situation arises, in particular, during docking. Previously, only ground control had reliable information about the mutual position of the spacecraft at this time. The information came to the ground measurement stations from the radio technical rendezvous equipment and from hundreds of sensors of various systems. It was transmitted to the flight control center, and, after processing, it was output to the screens of the operator panels of the analysis group in the form of columns of figures.

Now the on-board computer complex processes the basic information. As a result of this complex the cosmonauts are relieved of the analysis and storage of large secondary information flows, especially digital data. They now obtain it on the display screen.

Thus, whereas previously the information about the state of affairs in orbit was finally processed and formulated on the ground and only then was transmitted to the spacecraft, now it comes to the cosmonauts' panel in ready form, and it is transmitted to the control center in parallel. This not only facilitates the work of the crew, but it promotes the formation of a clear overview of the flight for the cosmonauts and permits monitoring of the true situation on the ground, directly on board, in real time.

The application of semiconductor integrated circuits and miniature electronic devices in the new orientation and motion control system of the spacecraft has made it possible to reduce the weight and size of the modules significantly.

In order to be convinced of the reliability of the on-board "Soyuz T" systems, the flight tests of the spacecraft were performed by the complete program -- including all operations which it must perform during operation.
The unmanned "Soyuz T" spacecraft was launched on 16 December 1979. It rendezvoused and docked with the "Salyut-6" station. Its flight continued as part of the orbital complex for 100 days. During this time tests were run on almost of the systems, including the integrated propulsion unit of the spacecraft. Then the

"Soyuz T" completed the entry and landing. The joint experiment performed by the orbital complex was correction of the orbit. Here the "Soyuz T" played the role of a tug.

From 5 to 9 June of this year during autonomous flight of the "Soyuz T-2" transport ship and joint flight as part of the orbital complex, various control conditions and new on-board systems of the "Soyuz T" series spacecraft in the manned version were tested and developed.

How did the flight go? During the first hours after launch, all of the participants experienced more anxiety than usual. Obviously, this is entirely natural -- a crew was on board the improved spacecraft for the first time. However, then everything fell into the customary track.

Immediately after insertion into orbit we gave a great deal of attention to the operation of the life support systems -- the remaining systems of the spacecraft had already been checked out in unmanned flight, and the life support systems were operating only now under full load. A trial operation of the control system, including manual control for the first time, was performed in the first orbits when the first two-burn rendezvous maneuver with the station was performed. On the second day of flight another two-burn maneuver was completed, after which the rendezvous phase with the "Salyut-6" station began.

In contrast to the preceding "Soyuz T," which, being unmanned, performed all of the operations of rendezvous and docking with the station, of course, automatically, we had to check this flight in both modes--automatic and manual--using digital and analog control circuits.

Rendezvous to 180 meters was performed automatically, and then the manual analog control circuit was switched on for docking with the station. After flying around it we performed the docking maneuver with the docking unit of the service module of the "Salyut-6."

The joint work with L. Popov and V. Ryumin lasted only a short while -- about 3 days. In the flight of the "Soyuz T-2" the main thing was to test its systems in autonomous flight and also in the process of rendezvous and docking with the station. However, the short period of working on the station was interesting and busy.

We quickly set up interaction with the crew of the "Salyut-6." It was pleasant to see the model order on the station, to observe the excellent condition of Leonid and Valeriy, the irreproachable teamwork and good adjustment to the big job ahead.

The separation of the spacecraft from the station and descent to the earth took place without incident. In this phase of the flight the new descent control system recommended itself well. The test program of the new transport ship was fully completed. The data obtained during the flight were processed and studied.

With the beginning of operational flights of the remodeled spacecraft, it, just as before, will help people to study and master space.

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SPACE SCIENCES

THE ALTITUDE PROFILE OF THE SCATTERING COEFFICIENT OF AIR IN THE RED REGION OF THE SPECTRUM BASED ON MEASUREMENTS FROM THE 'SOYUZ-22' SPACECRAFT

Moscow IZVESTIYA AKADEMII NAUK SSSR: FIZIKA ATMOSFERY I OKEANA in Russian Vol 16, No 8, Aug 80 pp 865-867 manuscript received 18 Sep 79

MATESHVILI, Yu.D., ROZENBERG, G.V. and SANDOMIRSKIY, A.B., USSR Academy of Sciences, Institute of Atmospheric Physics

[Abstract] A six-channel MKF-6 camera, designed by the Space Research Institute of the USSR Academy of Sciences and the "Karl Zeiss Jena" (GDR) enterprise, was used on board the "Soyuz-22" to take panoramic photographs of the earth's horizon in six bands: wavelengths from 480 to 850 nm, separated by a 60 nm margin, where the filters had passbands of 40 nm, with the exception of the 840 nm filter with a passband of 100 nm. The photometric processing of the material employed a modified IFO-451 microphotometer, with a resolution of 0.8 km in altitude and 4 km along the horizon. By using an approximate theory for the formation of the brightness picture of the day horizon from measured brightness sections, the altitude profiles of the optical thickness of the atmosphere, the scattering coefficient of the air and the turbidity were reproduced, employing a technique developed in earlier Soviet literature. The turbidity is shown graphically as a function of altitude for three spectral ranges in the red region of the spectrum. Other graphs depicting turbidity from measurements in earlier years also show that the zone where the air is relatively clear of aerosols, which marks the separation between the stratospheric and mesospheric layers, exists everywhere at all times, i.e., the zone is a specific geophysical phenomenon in need of explanation. It is also noted that the position of the region, how pronounced it is, and especially the shape and location of its boundaries are subject to strong but relatively slow variations both in space and time. The location of the turbidity minimum shifts by altitude of at least ± 5 to 6 km, from 23 to 35 km. Figures 3; references: 8 Russian.
[23-8225]

UDC 524.35

THE OBSERVATION OF MICROBURSTS OF HARD X-RADIATION BY THE SIGNE-2MP INSTRUMENT ON THE 'PROGNOZ-6' AUTOMATIC SPACE STATION

Moscow PIS'MA V ASTRONOMICHESKIY ZHURNAL in Russian Vol 6, No 9, Sep 80 pp 567-570
manuscript received 11 Nov 79, after revision 25 Feb 80

ESTULIN, I.V., Space Research Institute, USSR Academy of Sciences, Moscow

[Abstract] The results of counts of two x-ray burst detectors in the SIGNE-2MP system in the "Prognoz-6" station were statistically analyzed in a search for weak bursts. Some $8.25 \cdot 10^5$ frames of data for each detector were selected for analysis, which corresponds to 98 days of measurements during 1977 and 1978. The analysis excluded data obtained when the satellite passed within 60,000 km of the earth, as well as bursts from the sun. The maximum number of events was detected when the Crab nebula was observed from 6 through 23 December, 1977. Signals were observed for 17 days, amounting to 11 24-hour periods of actual observation. A maximum of 8 events per 24 hours with an energy of $4 \cdot 10^{-7}$ erg/cm^2 at the earth's surface were detected, where the pulse widths were from 1 to 10 seconds in an energy range of 30 to 40 KeV. It is noted that the pulsars PSR 0531 +21 and PSR 0540 + 23 also coincide with the count maximum registered by detector 2; the signals most likely come from the youngest pulsar PSR 0531 +21 formed with the Crab nebula. The localized coordinates of the observed x-ray sources and the region of the sky which was scanned are also presented in galactic coordinates; no concentration of events towards the center of the galaxy or the disk was detected. When the counts reported in this paper are referenced to the total solid angle, a greater number of burst events is found than the observed gamma bursts in the case of omnidirectional detectors reported in the literature. In studies with the Vela satellites where the detectors operated in collimators, an exaggerated number of events is also observed, as compared to the omnidirectional case. It is thus difficult to reference the counts found in experiments with collimator detectors to omnidirectional counts because of the ambiguity in the solid observation angle, which is not solely governed by the collimator. Figures 2; references 13: 8 Russian, 5 Western.
[18-8225]

INTERPLANETARY SCIENCES

THE ROLE OF RADAR IN PLANETARY ASTRONOMY

Moscow PRAVDA in Russian 20 Oct 80 p 7

KOTEL'NIKOV, V., academician of the USSR Academy of Sciences

[Abstract] Direct radar measurements of the distances between the earth and Venus, Mercury and Mars, which have been successfully made since the early 1960's, reduced the earlier error in the measurement of the astronomical unit, known then with an error of 50,000 to 70,000 km, by a factor of 10^3. Even after this refinement of the value of the astronomical unit, errors remained which required a more precise theory of planetary motion. Work performed with the 70 meter fully steerable dish of the Deep Space Communications Center has reduced the average range measurement error down to a few hundred meters; new theories predicated on experimental data from this facility and automated interplanetary probes sent to Venus (Venera-9 and 10) correctly predicted the radial geocentric motion of Venus within 3 to 6 km, where classical theories yielded errors of up to 500 km. Further tests of the new theory with the Venera-11 and 12 probe navigation systems confirmed the superiority of the new approach. The maximum altitude differences which can be distinguished on the surface of Venus with the 70 m antenna are about 2 km. Radar observations were made of Mercury, Venus and Mars from February to April 1980, to provide a real basis for a unified theory of the motion of the inner planets of the solar system. Also in 1980, measurements were made of the relief and reflectivity of Venus along the equator over a 14,000 km path; on Mars, the altitude profile along the 21st parallel north latitude was measured.
Figures 1.
[33-8225]

LIFE SUPPORT SYSTEMS FOR MANNED SPACEFLIGHT

Moscow ZEMLYA I VSELENNAYA in Russian No 6, Nov-Dec 80 pp 20-25

/Article by Professor B.A. Adamovich: "Life Support in Space"/

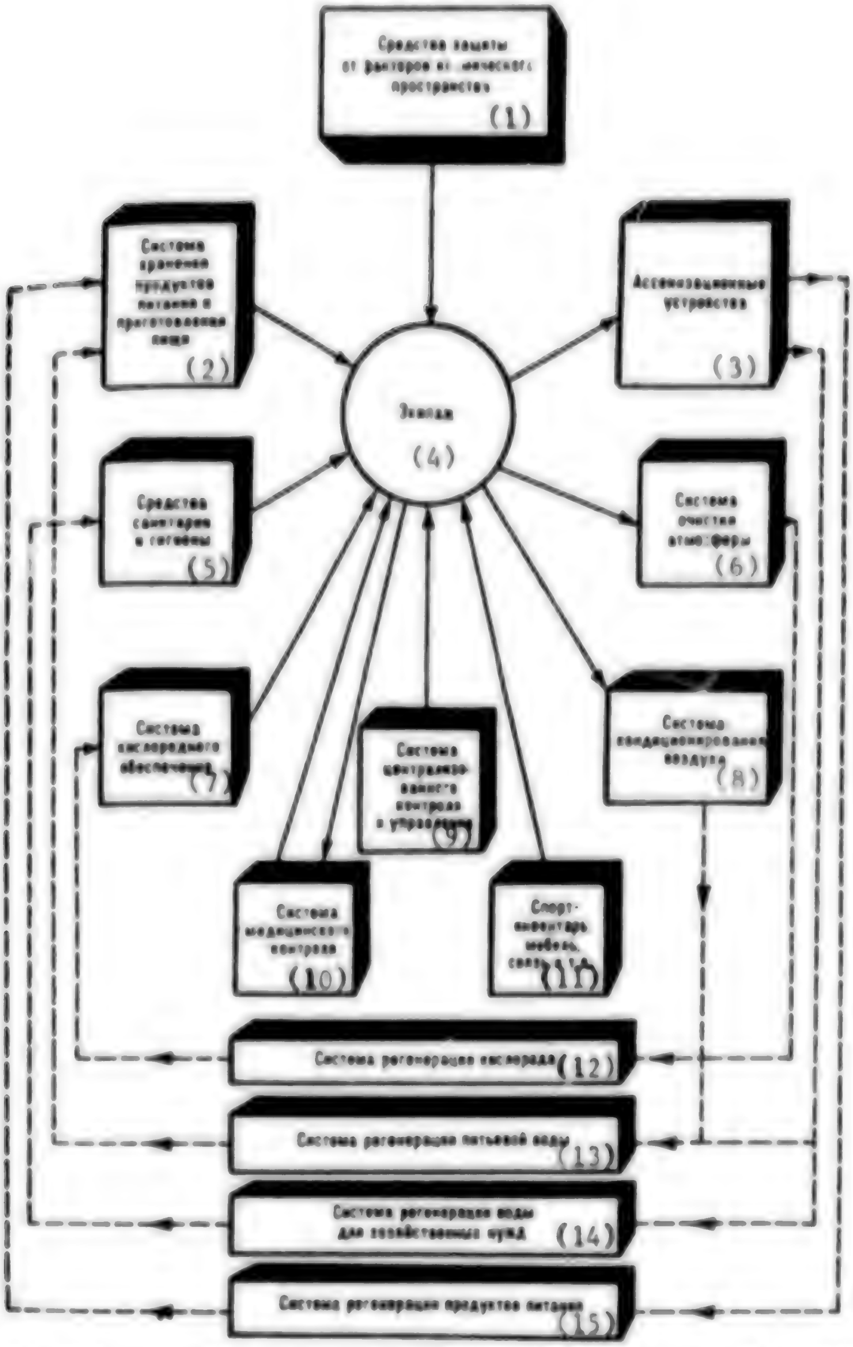
/Text/ In the crew quarters and working compartments of a spacecraft, it is necessary to maintain those conditions that enable the cosmonauts to carry out the flight program successfully and return to Earth safely.

What Is Life Support?

Life support in a spacecraft consists of the creation and maintenance, throughout the entire flight, of those conditions in the crew quarters and working compartments that insure a level of fitness for work on the part of the crew that is sufficient to carry out its assignments with a minimum probability of pathological changes in the human body. How is this done? It is necessary to achieve a substantial reduction in the effect on man of the unfavorable external factors of spaceflight (vacuum, meteoritic bodies, penetrating radiation, weightlessness, acceleration); to provide the crew with the substances and energy without which the body's normal vital activity is impossible (food, water, oxygen, light); to eliminate the products of man's vital activity and substances generated during the operation of the spacecraft's systems and equipment that are harmful to human health; to meet human requirements for movement, rest, external information and normal working conditions; to organize medical monitoring of the state of the crew's health and to maintain it at the necessary level.

The first ideas on life support methods for human beings during spaceflight were expressed by K.E. Tsiolkovskiy in 1895. He assumed that man would take with him into space a small part of the Earth's biosphere, so that the living conditions in a spacecraft would be similar to those encountered on Earth. In Tsiolkovskiy's opinion, such a "model of terrestrial processes" in a spacecraft would facilitate the adaptation of the human body to the conditions of spaceflight. He wrote: "Imagine a glass ball some meters in diameter that is fitted with a strong protective network of steel wire. Place in it some soil, plants, oxygen, carbon dioxide, nitrogen and moisture, and all the conditions for the survival of animals are fulfilled. Actually, that is what we see -- only on a large scale -- on the surface of the Earth!"

The problems of creating facilities for life support in space began to attract the attention of Tsiolkovskiy's followers: F.A. Tsander, M.K. Tikhonravov, S.P.



Schematic diagram of system for supporting human vital activity.

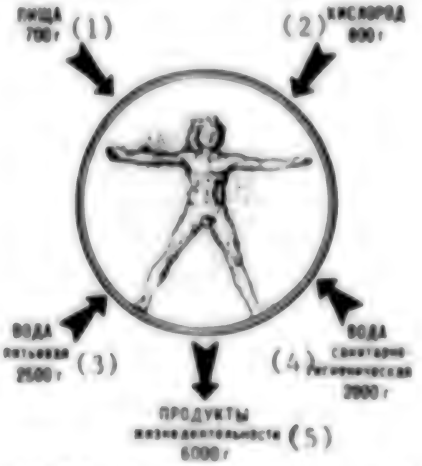
Key:

1. Facilities for protection against spaceflight factors
2. System for preservation of food products and preparation of food
3. Waste management units
4. Crew
5. Sanitation and hygiene facilities
6. Atmosphere purification system
7. Oxygen supply system
8. Air conditioning system
9. Centralized monitoring and control system
10. Medical monitoring system
11. Athletic equipment, furniture, communications and so on
12. Oxygen regeneration system
13. Drinking water regeneration system
14. System for regenerating water for housekeeping needs
15. Food product regeneration system

Korolev. As far as the time frame (1910-1935) was concerned, this coincided with the period of rapid development in aviation, and many practical solutions and facilities were tested for the first time during flights of the early aeronauts.

In 1935 S.P. Korolev noted: "Let us examine the characteristics of reactive craft fitted with liquid-fuel engines. First, there is the crew. Next, there is the vital reserve. This includes all the devices, instruments and gear for maintaining the crew's living conditions and its ability to work at high altitudes. Third, we have the cabin, which -- of course -- will be sealed."

Right now we can apparently already speak of the formation of a new scientific field that is located at the junction point of space biology, medicine, cybernetics, chemical engineering, electronics and other allied sciences. In the medical line it originates from aviation medicine and the theory of living in submarines, while the scientific and technical aspect comes from the technology for producing hygienic equipment for aviation and submarine use.


ПИЩА 700 г (1)
(2) КИСЛОРОД 800 г
ВОДА питьевая 2500 г (3)
(4) ВОДА санитарно-гигиеническая 2000 г
ПРОДУКТЫ жизнедеятельности 6000 г (5)

Material balance of a human being.

Key:
1. Food, 700 grams
2. Oxygen, 800 grams
3. Drinking water, 2,500 grams
4. Water for sanitary and hygienic purposes, 2,000 grams
5. Products of vital activity, 6,000 grams

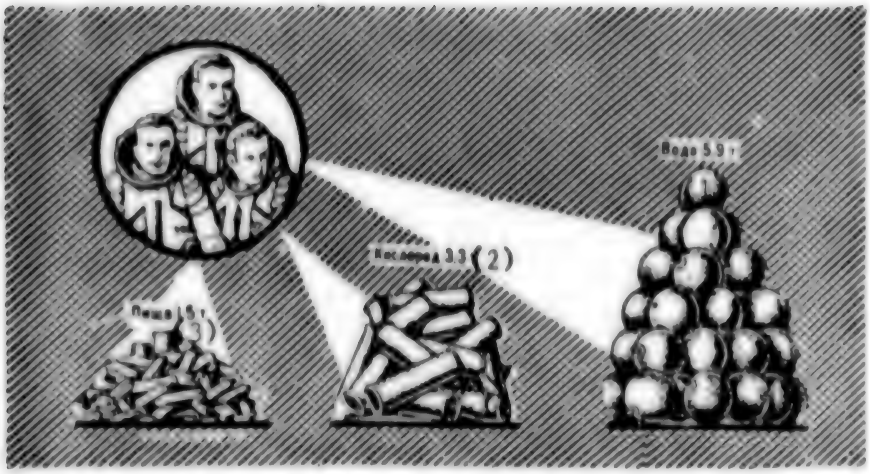
Food, Water, Oxygen

At the present time, in the development of life support systems the most difficult technical problems are those of supplying the human beings involved with food, water and oxygen. For normal vital activity, every day a man must consume 700 grams of food (dry weight) with a calorie content of 3,000-3,300 kilogram-calories, 800 grams of oxygen and 2,500 grams of drinking water, plus at least 2 liters of water for sanitary and hygienic purposes (including bathing). The products of his vital activity are either eliminated or regenerated (recovered) by physicochemical or biological methods. Food and water are delivered into space in the appropriate packaging, while oxygen is delivered in a chemically bound form.

If the products of the vital activity are not recovered, a crew of three on a 1-year flight will require the following amounts of these substances: food (allowing for packaging) -- 1.5 tons, bound oxygen -- 3.3 tons, water -- 5.9 tons. This is almost half the mass of the "Salyut-6" orbital station.

In the near future, regeneration systems will make it possible to recover almost all the oxygen and water on board a space station. Right now, water that has been used for washing and bathing is purified in a regeneration system. Exhaled moisture is condensed in a cooling and drying unit and then regenerated.

Regenerated water is used for drinking and to produce oxygen. It enters a purified water storage tank, where oxygen for breathing purposes is extracted from it by electrolysis, while the gaseous hydrogen reacts with carbon dioxide from a concentrator and forms water that is fed into the electrolyzer. Methane, which is a



Products and substances needed by a crew of three for a 1-year spaceflight. Key: 1. Water -- 5.9 tons 2. Oxygen -- 3.3 tons 3. Food -- 1.5 tons

gaseous byproduct of this process, is evacuated into space. In the example under discussion, the use of this system makes it possible to reduce the weight of the stored substances from 10.7 to 2 tons.

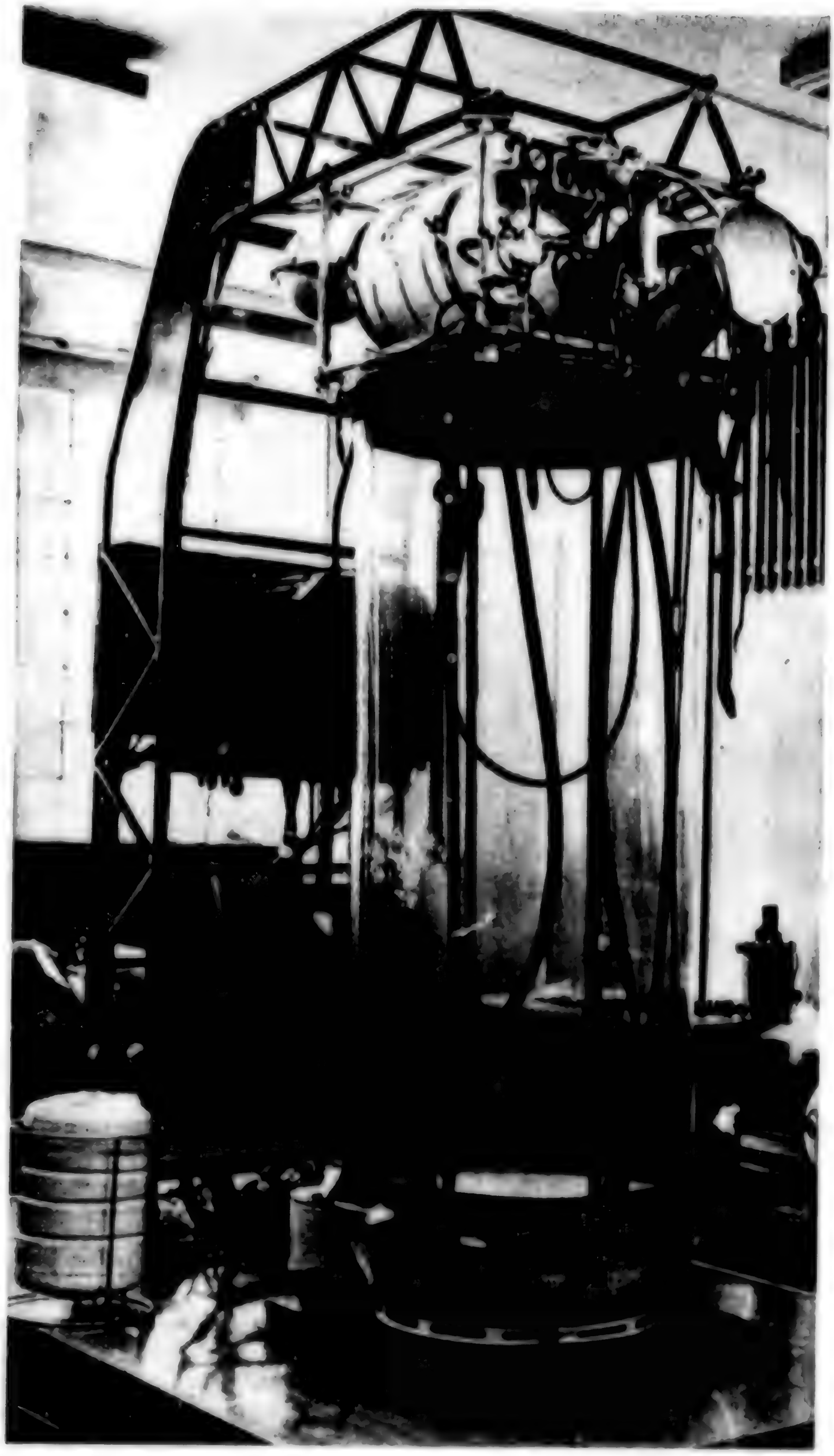
The necessary -- and quite comfortable -- conditions for the cosmonauts' work and rest have been created on board the "Salyut-6" station.

Food. The cosmonauts take their food with them. The crew's rations include various culinary items -- meat, bread, canned fruits, fruit and berry juices, pastry items. Cosmonauts eat four times a day (first and second breakfast, lunch and dinner). The menu consists basically of sterile products and dishes packed in preserving containers weighing 100 grams each and aluminum tubes weighing 165 grams each. At the first breakfast and lunch every day, there is a "supplement" -- one "Undevit" polyvitamin lozenge apiece.

An average daily ration, without packaging, weighs about 1,400 grams, and its calorie content is about 3,300 kilogram-calories. Food can be heated on board the station.

Along with the "official" rations, there are experimental ones consisting of sublimated, practically moistureless products. They may turn out to be extremely effective in the future, when there is sufficiently complete regeneration of water from the liquid products of the cosmonauts' vital activity. In this case the use of natural products, which contain an average of up to 60 percent water, will become inadvisable. Products processed by the vacuum drying method retain their properties for a long time, do not require the use of cumbersome devices, and can be packed in compact containers. Experimental rations usually consist of soups, shchi, meat, potatoes, juices and tea.

It is interesting that one of the first references to such rations can be found in the works of Fridtjof Nansen, the famous Norwegian explorer of the Arctic and a great friend of the young Soviet government. About 80 years ago, in his book "'Fram' in the Polar Sea," he wrote: "As a result, a guiding principle was established: such methods of preserving meat and fish as pickling, smoking or imcomplete curing (drying) are extremely unreliable and should be rejected as not achieving their



Shower unit in the "Salyut-6" station.

goal; when laying in provisions for an extended expedition it is necessary to consider the protection of food substances against spoiling and, in connection with this, to give definite preference to careful and complete drying or sterilization with the help of high temperatures."

With due consideration for the problems of spaceflight, sublimated food first underwent careful and thorough testing in a terrestrial medicotechnical experiment that lasted a year and was conducted in the USSR in 1967-1968.

Water. A no less important problem is supplying the crew with water. When water is stored, its properties change. At room temperature, there is deterioration of the taste qualities of water stored in closed food containers after only a few days. The amount of time drinking water can be stored is affected by its original microbe contamination and the amount of water being stored.

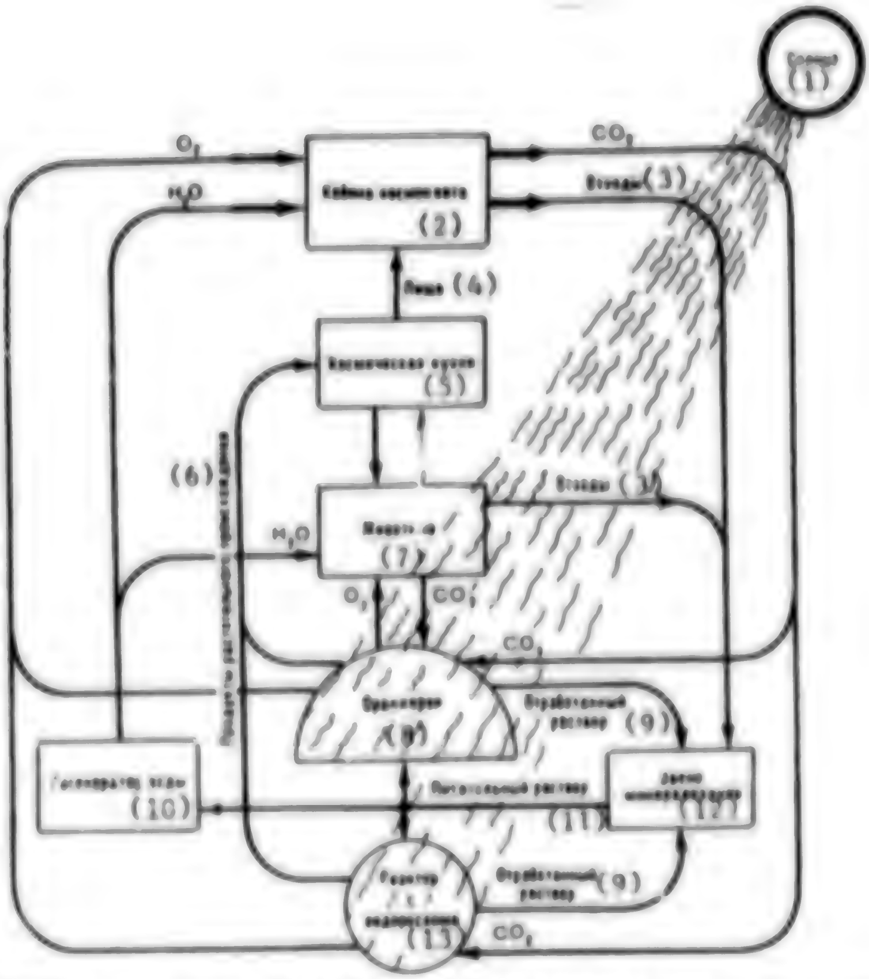
On board the "Salyut-6," the drinking water is stored in special containers. It is preserved by silver ions that are introduced electrolytically. The silver is adsorbed on the surfaces of bacterial cells, which leads to disruption of the microorganisms' metabolism and causes them to die.

Along with the stock of drinking water, the "Salyut-6" has an experimental system for regenerating water from atmospheric moisture condensate that makes it possible to supplement the drinking water reserves when necessary. The water that forms in the station's atmosphere as the result of the cosmonauts' breathing and perspiring condenses on the cold surfaces of cooling and drying units and is then collected in condensate storage tanks. This condensate is completely unsuitable for drinking since it contains a large amount of harmful, water-soluble impurities of both organic and inorganic origin. The regeneration system mentioned above purifies the regenerated water and brings it up to drinking quality. This is done with cartridges containing different ion-exchange resins (anionites and cationites) and activated charcoal, as well as a special unit for enriching the purified, practically distilled water with salts and microelements needed by the body. In the system there is also a unit for heating water (almost to boiling) so that it can be used to regenerate sublimated products, as well as for bathing water.

The shower unit is extremely simple, although this simplicity was achieved at the cost of protracted experimental work. The shower unit's booth is an elastic cylinder with two end caps that contain devices for mixing and spraying hot and cold water, supplying hot air, and removing the used-up mixture of gas and liquid.

Oxygen. The air in the working and living compartments is the usual two-gas (nitrogen and oxygen) atmosphere at a normal total pressure. Oxygen regeneration is performed chemically, with the help of a special atmosphere regeneration system. The air's oxygen and carbon dioxide contents are regulated with the help of a gas analyzer. An independent filter is provided in order to eliminate unpleasant odors and remove harmful impurities. Vital activity wastes, together with other waste products (leftover food, empty tubes and preserving containers, used filter cloths), are placed in special sealed containers and periodically ejected into space through a lock, after which they burn up when they fall into the dense layers of the atmosphere.

This is how life support has been organized on board the "Salyut-6." Almost everything that man needs for normal vital activity under spaceflight conditions is



Schematic diagram of closed, ecological life support system.

Key:

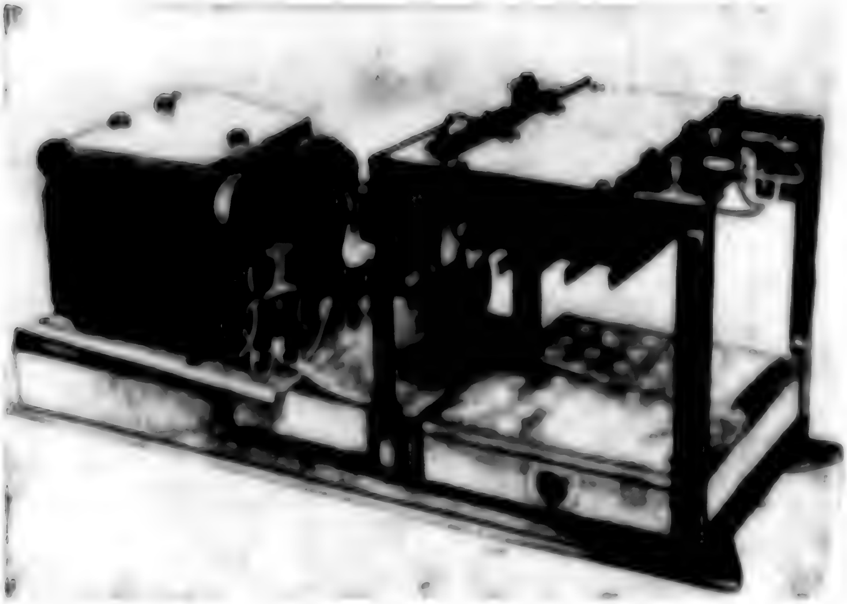
1. Sun
2. Cosmonauts' cabin
3. Waste products
4. Food
5. Space galley
6. Products of vegetable origin
7. Animals
8. Greenhouse
9. Spent solution
10. Water regenerator
11. Nutritive solution
12. Mineralization unit
13. Reaction vessel with algae

delivered from Earth. This is an extremely reliable reserve, but it can be reduced substantially by using the systems for the physicochemical regeneration of the products of vital activity, and reduced almost to nothing when there is biotechnical circulation of matter.

Units in the Ecological System

It is obvious that in the future there will appear physicochemical systems that put other products of man's vital activity into circulation.

As the individual biological elements of a closed ecological system are developed, it is advisable to include them in on-board physicochemical life support complexes.



Space greenhouse that was tested on the "Cosmos-1129" biological satellite.

One of the first biological units will probably be a space greenhouse, different models of which are being studied under the flight conditions of orbital stations and biological satellites. K.E. Tsiolkovskiy saw in the higher plants a source of oxygen for breathing and a means of producing food on board a spacecraft. He wrote: "...in order to insure a food supply for a man during a flight in a rocket, he must take with him various plants that will purify the air and bear fruit..."

A very interesting experiment with a space greenhouse was carried out on board the "Cosmos-1129" biological satellite. In this greenhouse, plants were grown by the hydroponic method, with automatic maintenance of a constant level of moisture in the substrate (the soil substitute). The substrate consisted of porous substances that had been preliminarily saturated with mineral salts. Every 10 minutes, two motion picture cameras took pictures that provided a frame-by-frame survey of the developing plants, as a result of which a unique motion picture film was obtained. It showed that above-ground plant organs orient themselves quite well in the direction of the light flow, even in the absence of gravity. Plants form that cannot be indistinguished morphologically from those grown under terrestrial conditions. Investigations of plants that were returned from orbit showed that the leaves have a normal structure and the structure and relationship of the tissues are the same as in terrestrially grown plants. The leaves' vascular bundles, epidermis and stomata show normal development. As a result of the experiment it became clear that plants in space -- as is the case with cosmonauts -- "feel good."

At the present time we are developing space greenhouses that are characterized by minimum weight and energy consumption, more nearly complete utilization of mineral fertilizers and sowing areas, and continuity of the crop yield.

The last three features are of decisive importance for agricultural production, so much that is useful from operations with space greenhouses is now being used in terrestrial practice.

"Samorod" cassette-conveyor unit.
Key: 1. Variable pitch screw 2. Nutritive solution

The USSR Ministry of Health's Institute of Medicobiological Problems has developed the "Samorod" device, which moves plants apart as they grow, provides them with mineral nourishment, and operates on the conveyor principle. Under laboratory conditions with artificial light, 400 grams per day of dry biomass were obtained from a single square meter for a period of 2 years. Experiments conducted under field conditions near Simferopol' confirmed this figure. Converted to a season for the southern regions of the country (8 months of warm, sunny days), this is 10,000 quintals per hectare of dry biomass instead of the 400-500 quintals now obtained per hectare. The great advantage of this method is the economic consumption of water and mineral fertilizers. It is a well known fact that in fields, up to 70 percent of the fertilizer misses the plant roots and is carried off by water. Much remains to be done before the widespread introduction of this method in the national economy, but one thing is clear: in recent time, the growing of plants in space has occupied a significant place on Earth, as well as in space.

In the future, as biological systems are improved and the duration of space flights increase, biological systems will apparently become the basic type of life support system.

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SPACE APPLICATIONS

USE OF SATELLITE PICTURES FOR AGRICULTURE

Tbilisi KOMUNISTI in Georgian 24 Jul 80 p 4

[Interview with Telavi Zonal Hydrometeorological Station Director M. Makhatelashvili by D. Gergishvili, under rubric "Space in Agriculture!": "Taking Satellite Pictures in Telavi"]

> [Text] On 10 July IZVESTIYA reported that the Meteor satellite provides Georgia's Anti-Hail Service with timely warning about the approach of bad weather. Weather forecasters of the Telavi Hydrometeorological Observatory have begun to take pictures (make surveys) of atmospheric processes of the Caucasus. In this connection, our correspondent asked Telavi Observatory Director M. Makhatelashvili to answer a few questions.

[Question] My dear Mikheyl, the Georgian Hydrometeorological Service recently marked its 50th anniversary. Could you briefly recount the history of meteorology in Kakheti?

[Answer] As you know, Kakheti's natural landscape presents a real kaleidoscope, and its soil, topography, and climate are quite varied. The region has abundant flora and fauna and is suitable for a variety of economic sectors. The relief on the slopes and foothills of the Great Caucasus and the Tsivgombori Mountains, the Alazani and Iori river valleys, and the abundant sunlight add up to a varied climate which fosters a multisector economy and at the same time creates changeable weather conditions.

Organized meteorological observations in Kakheti began only in the 1900s. Stations were opened on the princely estates--Napareuli, Ikalto, Tsinandali, Telavi, Mukuzani, Kardanakhi, Signakhi....It demonstrated the Kakhetian's concern for his vineyards, but it must be noted that these stations did not involve research or take account of physical and geographical characteristics and therefore could not achieve their aim, either in terms of the spread of meteorological elements (in accordance with the terrain) or the influence of the terrain on those elements. Fifty years ago, the Hydrometeorological Service was set up to comprise all those stations, laying the groundwork for scientific research.

An agrometeorological station and seasonal weather forecasting and aerological groups have been operating in Telavi since 1975. The steady growth of the economy, especially agriculture, as called for in the program of the 25th party congress, made it mandatory to set up a Hydrometeorological Center in Kakheti. Now the observatory comprises several economic service departments--weather forecasting, aerological, agrometeorological, hydrological, meteorological, a fourth-class aerial meteorological station installation-repair group, and so on. Kakheti now has 11 meteorological stations and 14 hydrological and agrometeorological observation posts. Plans call for opening up new weather observation posts.

[Question] Which of the observatory's main functions do you give priority to in terms of future use in the economy?

[Answer] The observatory's main tasks are to study the agroclimatic conditions affecting grapes and to take steps to protect the crops against especially dangerous hazards, to correctly forecast the weather, particularly hail, monitor the air, the soil, and river and environmental pollution, evaluate agrometeorological conditions, draw the appropriate conclusions, and provide recommendations to the various agricultural organizations.

[Question] What about the new development of using data from satellites--what effect has that had?

[Answer] The use of data from weather satellites is a considerable scientific achievement. The innovation was adopted through the help of high-level party and economic organs and the initiative of our own personnel. The equipment we use to collect data and pictures from the Soviet satellite was given to us by the Georgian Hydrometeorological Service. As for its effectiveness, we can cite actual examples. Before it was put into use in the first half of 1979, weather forecasts in Kakheti were 84.3 percent accurate. After it went into operation, the figure was raised to 87.5 in the same period of 1980. Last year, hail forecasts were 94.5 percent accurate; this year the figure is 98.2.

On 12-14 April this year, air temperatures in Kakheti dropped to 1 to 3 degrees below zero. This temperature can easily damage crops in the growing season. Our forecasters predicted the cold snap 10 hours in advance and issued the necessary recommendations, steps were taken, and damage was avoided. I believe our work effectiveness should be evaluated by the performance of the farms which we serve, because ours is an applied service which does not produce goods.

[Question] Could you tell us briefly about your working conditions?

[Answer] Correctly evaluating how essential our service is, Telavi Rayon's officials have accorded us particular attention in the past while. They have provided a building to house our facility and regularly supply both material and moral help. But we do have our problems. For example, we're still short of supplies for atmospheric probes [zondirovaniye], and sometimes we have to miss a probe interval. This impairs our efficiency, leads to mistakes, and sometimes places our work in jeopardy.

We do expedition work to investigate the agrometeorological conditions of farm crops (actual soil moisture, crop growth and development, microclimates in frost-prone areas, and so on). This makes it mandatory that we have the necessary transportation.

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SPACE OCEANOGRAPHY: PROBLEMS AND PROSPECTS

Leningrad PROBLEMY ISSLEDOVANIYA I OSVOYENIYA MIROVOGO OKEANA in Russian 1979
pp 111-133 signed to press 30 Oct 79

NELEPO, B.A., director, Marine Hydrophysical Institute, UkSSR Academy of Sciences

[Abstract] Space oceanography is based on recently developed remote methods for measuring oceanological parameters. It is possible to make remote measurements of such ocean parameters as the global topography of its surface, state of the water surface, sea currents, spectrum and direction of wave propagation, wind in the near-water layer, radiation balance at the ocean surface and temperature at the ocean surface. The role of artificial earth satellites in investigations of the world ocean can be greatly expanded. This expansion is inhibited by the inadequate development of remote measurement methods, the limited possibilities of instrumentation and absence of thoroughly developed theories and methods for the processing and interpretation of the collected information. Remote methods are making it possible to carry out measurements only of surface hydrophysical fields, but these are only a reflection of the processes transpiring in the depths of the ocean. In the foreseeable future direct study of the ocean depths will probably be impossible for layers below the seasonal thermocline. But space oceanography has already exerted a considerable influence on the entire character of investigation of the ocean, making necessary a considerable re-examination of existing research methods. The most immediate phenomena which warrant investigation from space are: thermal anomalies and frontal zones, the active layer of the ocean and large-scale interaction between the ocean and the atmosphere. This review discusses the informative hydrophysical parameters and requirements for their determination. Particular attention is given to the influence of the skin layer on the development of methods for remote sounding of the ocean. The important problem of the atmospheric transfer function and allowance for its influence is examined in detail. A special section is devoted to investigations in the visible spectral range. Also considered is the highly promising use of radar systems in oceanographic investigations. In the years immediately ahead, it is concluded, space oceanography methods will become a highly effective tool in the implementation of major oceanographic projects. Figures 1; 23 references: 16 Russian, 7 Western.
[29-5303]

THE APPLICATION OF REMOTE METHODS TO TECTONIC STUDIES IN THE WESTERN PORTION OF THE SIBFRIAN PLATFORM

Novosibirsk TEKTONIKA SIBIRI in Russian Vol 8 [METODOLOGICHESKIYE PROBLEMY TEKTONIKI I VOPROSY TEKTONICHESKOGO RAYONIROVANIYA], 1980 signed to press 14 Dec 79 pp 102-120

GERASIMOV, L.M. and LUSKINA, V.Yu.

[Abstract] Television pictures taken from "Meteor" and "Cosmos" meteorological satellites are now available for the entire Siberian platform. The western portion of this platform has been surveyed with radar mapping and aerial photography in recent years; photographs from manned spacecraft and from the American ERTS satellite, as well as gravimetric data also exist for this area. The fault tectonics of this region are analyzed through the interpretation of TV images with scales of from 1:3,500,000 to 1:2,500,000, and incorporating data from the other sources. Ultra-small-scale photographs such as the TV images naturally filter the image of the terrain. The majority of large trap fractures which exceed the resolution of the TV picture do not appear in the photos, while regions of fracture bunching corresponding to the location of deep faults are more clearly pronounced. An entirely new structural element in this region was detected through TV images: ring structures of two orders; those with a diameter of up to 200 km and smaller ones with a diameter of 30 to 40 km. Interpretation of radar images also established the widespread development of rings not exceeding 10 to 12 km, though radar did not reveal the large structures. Other features of remote sensing techniques as applied to the mapping of this area are compared and examples are given in the form of detailed maps showing the structural interpretation of radar images and mosaic aerial photographs. These maps show such features as the intrusion of dolerites, small trap faults, peat fields, Icelandic spar, hydrothermal metasomatisms as well as iron, copper, strontium, barium and other deposits. It is concluded that: 1) The most effective technique is the interpretation of photographs supplemented with gravimagnetic data; 2) The basic materials which make it possible to compile geological maps are small scale aerial photographs; 3) The utilization of TV images from space is most effective in the compilation of schematic structural maps, while it is expedient to use radar imaging to draw maps with different scales; 4) These remote techniques permit objective and adequately complete representations of the structural tectonic features of a region, especially as regards manifestations of block tectonics and volcanic structures and improve the efficacy of forecasts predicting useful mineral deposits. Figures 4; references: 9 Russian.
[28-8225]

UDC 551.242.3(571.6)

THE STRUCTURE OF THE JOINT REGION OF THE VERKHOYANSK-CHUKOTSKIY AND THE KORYAKSKO-KAMCHATKA AREAS BASED ON DATA FROM THE 'METEOR-25'

Moscow GEOTEKTONIKA in Russian No 5, Sep-Oct 80 pp 105-118 manuscript received 3 Dec 79

FILATOVA, N.I., MAZHENSHTEYN, F.A., KUZNETSOVA, I.A. and SMELOVSKAYA, M.M., "Aerogeologiya" All-Union Scientific Production Association

[Abstract] Multiband scanner images of the eastern region of the USSR obtained from the "Meteor-25" satellite were interpreted to ascertain new geological features of the territory (from the basin of the Omolon River to the shore of the Bering Sea). The photointerpretation was based on: 1) Ascertaining clear-cut geometrical elements of the images and differentiation of the fields exhibiting contrasts in different photographs; 2) Summing and superimposing image elements singled out in different photographs, and 3) Grouping photographic image elements into geological units. The units which are distinguished by the deep structure of the earth's core also differ in terms of the nature of the interpretative structural elements and the density of their occurrence. Data is obtained from the space photos which supplements or substantially changes the understanding of the tectonic structure of individual sections: the position and structure of the region of the Anadyr' fault is more clearly distinguished; the powerful Okhotsk-Okonayt system of faults was revealed, which intersects the Anadyr' fault at an acute angle. The structure of the Talovaya-Maynskiy region, as well as Koryakskiya and the Olyutorskiy trough is governed by numerous thrusts and mass overthrusts, which differ in extent and thrust angles. Several general classes of ring structures were detected: megastructures 300 km in diameter and more, systems with diameters of 60 to 100 km and rings a few tens of kilometers across. Transregional lineaments with a latitudinal orientation which intersected earth core elements at varying depths were also found. The interpretation of such lineaments and rings is also significant in the determination of useful mineral deposits. A detailed geological map is shown for this region, with the Anyuysko-Penzhinskiy block clearly indicated along with the major linear and ring structures in addition to other tectonic features. Figures 1; references: 24 Russian, 1 Western.
[19-8225]

UDC 550.814:553.98(470.4)

A PROCEDURE FOR THE INTERPRETATION OF LINEAMENTS IN THE AERIAL AND SPACE GEOLOGICAL CHARTING AND MAPPING OF ENCLOSED OIL AND GAS BEARING REGIONS

Moscow IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: GEOLOGIYA I RAZVEDKA in Russian No 10, Oct 80 pp 34-40

ROMASHOV, A.A., BOTOVA, O.Yu. and GRIBENNIKOVA, T.G., "Aerogeologiya" Scientific Production Association

[Abstract] Pictures taken from space (scales of 1:10,000,000 to 1:2,500,000 and greater) and high altitude intermediate and large scale aerial photographs of the Caspian Depression basin were interpreted to ascertain the structural tectonics

of the region. The factors governing the detection, recognition and classification of lineaments and ring structures are discussed briefly in light of materials from the "Salyut-4" spacecraft. The specific advantage of the use of large scale photography in enclosed oil and gas bearing regions (such as the Carpian syneclise, the Dneprovsk-Donetsk Depression basin, the Urals-Povolzh'ye area, etc.) is the fact that different classes of linear structures corresponding to large faults or regions of increased fracturing in the case of hidden faults are indicative of the formation of oil and gas accumulations and the traps associated with them. It is noted that the use of the aerial and space photographs is more than just an important adjunct to conventional field studies, since frequently the network of lineaments found from larger scale photographs differ fundamentally from that known previously. The discussion is illustrated with two schematic maps of linear elements in western Kazakhstan in the region between the Emba and Temir rivers. References: 13 Russian.
[17-8225]

UDC 551.243.1

ON FRACTURES IN THE SOUTH OF THE EASTERN EUROPEAN PLATFORM FOUND AS THE RESULT OF INTERPRETATION OF TELEVISION PICTURES FROM SPACE

Moscow IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: GEOLOGIYA I RAZVEDKA in Russian
No 10, Oct 80 pp 28-33

GOLIZDRA, G.Ya., Dnepropetrovsk Mining Institute

[Abstract] Television photographs taken from the "Meteor-28", as well as some from the "Meteor-25" satellites, between the summer of 1977 and the fall of 1978 were interpreted to determine the major lineaments of the southern portion of the eastern European platform and then map them on a scale of 1:10,000,000. This map is shown covering an area between approximately 43° to 52° North Latitude and 20° to 40° East Longitude; the major geological features of the area are discussed in light of the revealed lineaments. The results show that small scale TV images provide new data on the fault tectonics of the earth's core. Sublatitude systems of considerable extent, as well as sections where they intersect various tectonic units were ascertained from these images. The formation and distribution of the lineaments are in good agreement with the hypothesis that the dominant role is played by compressive core stresses, running from the south-southwest. Quite recent fractures are found within the platform. The results of the TV studied of the distribution of fault fractures are a reliable basis for their subsequent study using detailed photographs. Figures 2; references: 17 Russian.
[17-8225]

SPACE POLICY AND ADMINISTRATION

PETROV REVIEWS SOVIET SPACE ACHIEVEMENTS

Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 9, 1980 pp 36-37

[Article by Academician B. Petrov, chairman of the "Interkosmos" Council of the USSR Academy of Sciences]

[Text] The world is faced with a number of global problems on the natural scientific and production levels, the solution of which requires the united efforts of all peoples. These are the problems of raw material resources, power engineering, the monitoring of the state of the environment and preservation of the biosphere, and others. Space research -- one of the most important areas of the scientific and technical revolution -- will play an enormous role in their cardinal solution.

Cosmonautics is clearly demonstrating to all the world the fruitfulness of world creative labor, the advantages of the united efforts of different countries in the solution of scientific and national economic problems.

The growth of the economic and scientific potential of our homeland, successful implementation of the resolutions of the 25th Congress of the CPSU and the assignments of the 10th Five-Year Plan are permitting successful continuation of broad operations to study and use outer space in the interests of science and the national economy, in the interests of peace and progress on earth.

The flight of the "Salyut-6" orbital scientific station continues. The fourth basic cosmonaut expedition made up of L. Popov and V. Ryumin is working successfully on the station. The station has been in near-earth orbit for almost 3 years, including 1-1/2 years in the manned mode. During this time the creation of scientific research complexes made up of the "Sayut-6" station and two spaceships -- the transport type "Soyuz" and the automated cargo type "Progress" -- has been mastered. These complexes are opening up new posibilities in the investigation and the conquest of outer space. The test flight of the improved "Soyuz T-2" transport ship has been successfully completed.

The longest manned flight in the history of astronautics, the 175-day flight of cosmonauts V. Lyakhov and V. Ryumin, which took place from 25 February to 19 August 1979, became an outstanding achievement of Soviet science and engineering. The cosmonauts have completed a broad program of medical-biological, geophysical, astrophysical and technological research and experiments, including the experiments in accordance with the plan for international cooperation.

They also performed important work of a preventive-repair nature of significant volume which made it possible to increase the operating life of the "Salyut-6" station.

An important achievement of Soviet cosmonautics and a new step in extra-atmospheric astronomy was the creation and use of the KRT-10 space radio telescope on board the orbital complex with a 10-meter diameter antenna which was delivered in dismantled form to the "Salyut-6" station by the "Progress-7" cargo spacecraft. The cosmonauts V. Lyakhov and V. Ryumin assembled and unfurled the antenna, they installed the stellar orientation system, the radio telescope control panel, data recording system and exact time unit.

Studies began with measuring the basic parameters of the radio telescope with observation of the radio wave length emission of Cassiopeia A and the Sun. The scientific program using the radio telescope included the geophysical studies -- the development of methods of studying the radio thermal emission of the continents and oceans in the interests of earth science and the national economy and also radio astronomical studies of sources located beyond the solar system, in particular, the radio mapping of the Milky Way and radio astronomical pulsar observations.

The large radio telescope built for the first time in space opens up a new prospective area of research -- space radioastronomy. The antenna system with an "earth-space" base is the first step in the creation of future radio interferometers with base significantly exceeding the diameter of the earth and, consequently, with much greater resolution than can be achieved using earth means.

The installation of the radio telescope on the "Salyut-6" station also made it possible to open up a new area in space technology -- the creation of large collapsible and unfurlable structures in orbit.

The long flights of Soviet cosmonauts are evidence of the high level of Soviet science and engineering. This is also an outstanding achievement of Soviet space biology and medicine. As a result of improving the preflight training system of the cosmonauts, improving the sanitary-hygienic conditions of their vital activity on board the "Salyut-6" station and the application of special measures to prevent the unfavorable effects of weightlessness on all of the crews, it was possible to maintain a high level of physical fitness. This was especially convincingly demonstrated by the space walk of V. Lyakhov and V. Ryumin at the end of the 6-month orbital flight.

An important contribution to the medical-biological support of long-range manned space flights was made by numerous ground (laboratory) medical studies and also the biological experiments performed on board the "Salyut" orbital stations and the "Kosmos" biological satellites.

In evaluating the entire set of scientific data obtained at the present time on the reactions of the different biological systems to the effect of space flight factors, it is possible to look with optimism at the prospects for further increase in duration of manned flights into space.

The Soviet automatic interplanetary stations "Venera-11" and "Venera-12" were inserted into heliocentric orbits after execution of the Venus atmospheric research program. During the flights of both stations, measurements were systematically taken of the solar wind characteristics, and the cosmic radiation of solar and galactic origin were investigated.

The complex Soviet-French international experiment to study gamma bursts -- weak echos of enormous cosmic explosions occurring in the depths of our galaxy as a result of which more energy is released in a few seconds than the sun emits in a year -- went highly successfully. The interpretation of the results of this experiment is being made using data obtained from the high-apogee "Prognoz-7" satellite, the "Meteor" satellites and also data from the foreign "Pioneer-Venus" and "Helios" spacecraft and the "Vela" satellites.

As a result of the high sensitivity of the equipment of the "Venera-11" and "Venera-12" stations, it was possible to establish that the source of gamma bursts located in the constellation Dorado is related to an old x-ray pulsar -- a neutron star with mass on the order of the solar mass. This is the first experimental proof of the relation of the gamma bursts to the neutron stars -- a great scientific discovery.

In March of this year the ultraviolet spectrometer of the "Venera-12" station measured the radiation of the recently discovered Bradfield comet which has an orbital period around the sun of 300 to 400 years. The measurements were performed when the comet had already left the sun and was at a distance of about 150 million kilometers from the station. Such measurements helped to investigate the composition of the material of comets (little-studied objects of the universe), and they can be taken only outside the earth's atmosphere.

Continuing the study of the planets, the interplanetary medium, the sun and the sun-earth relations and also astrophysical research, which is necessary to discover the basic laws of the structure and evolution of the universe, Soviet scientists and specialists are giving more and more attention to the applied areas of space research in the interests of various branches of the national economy.

Communications and television systems are being developed constantly. The "Orbita" communications system which has operated since 1967, is being improved and expanded. It includes the "Molniya" satellites in high-elliptic orbits, the "Raduga" and "Gorizont" satellites in geostationary orbits and the ground transceiving stations with antennas 12 meters in diameter. The number of "Orbita" receiving stations located in remote parts of the Soviet Union has reached 85. The number of stations which, along with the reception of television and radio broadcast programs are realizing telephone and telegraph communications and reception of images of central newspaper copy has increased.

The development of the "Ekran" satellite television broadcast system using satellites in geostationary orbits and a broad network of simplified ground receivers for collective-use is continuing. This system is servicing the regions of the Trans-Urals, Central Siberia and the Far North, and at the present time it has a ground network which includes about 500 installations.

In 1979 the new "Moskva" [Moscow] satellite television system began to be introduced, which makes use of the "Gorizont" communications satellites in geostationary orbits and the "Moskva" ground stations with antennas 2.5 meters in diameter. This system is designed to service the regions of the European part of the USSR and the Far East. The joint use of satellite and ground communications media will in the near future provide 93% of the population of our country with television broadcasting.

Artificial earth satellites have become a powerful means of investigating the earth and its atmosphere. The "Meteor-2" system permits us to obtain global images of clouds and the earth's surface in the visible and infrared bands of the spectrum and to monitor the radiation situation in near-earth space. An important advantage of the new system is being successfully realized: television images of the earth's surface are being received by a broad network of simplified ground stations in the territory of the country. Information from the "Meteor-2" satellites is also being received in foreign countries which are members of the World Meteorological Organization.

According to the data of the primary users of space information, its use already today is yielding a cost benefit reckoned in hundreds of millions of rubles per year.

International cooperation is successfully developing in the study and conquest of outer space for peaceful purposes. Scientific relations are developing most actively with the fraternal socialist countries in accordance with the multi-aspect "Interkosmos" program. The Socialist Republic of Vietnam has become the tenth country to participate in this program. Both manned and automated space means are being used for joint research and experimentation.

The flights of the international crews under the "Interkosmos" program are continuing. A new cosmonaut -- citizen of the Socialist Republic of Vietnam Fam Tuan -- has become a member of the family of cosmonauts of the fraternal countries of socialism including representatives of the USSR, Czechoslovakia, the Polish People's Republic, German Democratic Republic, People's Republic of Bulgaria, and Hungarian People's Republic. Exercises and training sessions with cosmonaut candidates -- citizens of the Republic of Cuba, the Mongolian People's Republic and Romania -- are being held at the present time at the Cosmonaut Training Center imeni Yu. A. Gagarin. They, along with our cosmonauts, will participate in flights on Soviet spacecraft and stations.

The latest launches in the "Interkosmos" satellite series and the high-altitude "Vertikal'" rocket series have taken place. The "Interkosmos-20" satellite had new missions--complex study of the surface of the world ocean and development of an automatic data gathering system from ground platforms and marine buoys. The "Vertikal'-8" high-altitude rocket was launched to continue the complex studies of short-wave radiation of the sun.

A prospective program is being developed for our cooperation with the socialist countries with respect to all basic areas of space research. This program includes complex experiments on manned and automated spacecraft. They include the plans for research in the field of extra-atmospheric astronomy and astrophysics, research in the field of space material sciences, the study of processes and phenomena in the solar system, including solar-terrestrial and magnetospheric-ionospheric relations. Important significance is being attached to the use of the results of space research in the national economy.

The cooperation of our country with India, France, Sweden and Austria is developing on a bilateral basis.

In the past year, the second "Bkhaskara" Indian satellite has been launched from the territory of the Soviet Union by a Soviet booster rocket. This satellite is designed to study natural resources. The parties have also agreed to launch a third Indian satellite. An accord on joint flight of USSR and Indian astronauts has been reached.

A number of interesting studies have been made within the framework of the Soviet-French and Soviet-Swedish cooperation in space. Large-scale joint projects for the study of the atmosphere of Venus, building a gamma telescope and investigating aurora polaris are being prepared.

In accordance with the agreement, the preparatory operations are being conducted on a high level, and a scientific program for joint flight of USSR and French astronauts is being developed.

All of the collectives participating in the study and conquest of outer space, preparing to celebrate the 26th Congress of the CPSU in a worthy manner, are full of resolution to increase the effectiveness and quality of their work, to multiply the practical fruits of space research for the good of our homeland, in the interests of all mankind.

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MILITARY AND POLITICAL EFFECTIVENESS OF U.S. SHUTTLE PROGRAM QUESTIONED

Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 9, 1980 p 39

[Article by Engineer G. Kostin]

[Excerpt] The "Space Shuttle" was developed as the first step in a large-scale program in the interests of the aerospace industrial complex of the United States However, it has already become obvious that a number of advantages used by NASA as arguments in favor of the MTKK [multiple-use transport space ship] have turned out to be difficult to provide in practice. As work on the project has proceeded, the volume and the proportion of military goals has increased. Actively introducing the achievements of scientific and technical progress into the arsenal of the means to struggle to maintain their positions in the international arena, the political leadership and large monopolies of the United States are trying to secure new capability for influencing other countries. The "Space Shuttle" project is one of the channels by which the United States will try to influence international relations.

At the present time the building of an MTKK is connected with significant expenditures for the United States which will not begin to show returns in the near future. However, the effort to secure an advantage in solving important military problems, to obtain advantages from space technology and leadership in international cooperation in the conquest of space is forcing the political leadership of the United States to go to enormous expenses for the "Space Shuttle" program which, however, appears to be far from the best means of solving the stated problems either in engineering respects or from the point of view of the foreign policy and internal affairs of the United States.

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'TASS' VIEWS U.S. 'GENEROSITY' TO SPACE SHUTTLE PROGRAM

Moscow TASS in English 2625 GMT 7 Jan 81

[Text] New York, 7 Jan (TASS)--Members of the crew of the multiple-use spaceship "Shuttle" on Tuesday tested actions for eventuality of an accident at the blast off, at the John Kennedy Space Research Centre in Cape Canaveral. As was reported by the UPI, the cosmonauts Robert Crippen and John Young in space suits several times jumped out of the "Shuttle" and ran to a trolley intended to take them to a safe underground bunker.

Despite all NASA's efforts, the launching of the new spaceship has been postponed for 2 years now because of numerous accidents and technical failures. Yet another date is 17 March, this year. Meanwhile, "the Shuttle" expenditures have already doubled the initial appropriations and reached $9,000 million. In September last year the congress earmarked additionally $285 million for the project.

The legislators are generous because "Shuttle" has actually turned into the Pentagon's favorite creation. The U.S. Defense Department introduced its corrections into the draft programme of the spaceship: the size of the "Shuttle" cargo compartments was increased which will make it possible to put spy satellites in orbit and a considerable quantity of equipment for creating space military bases. The U.S. Defense Secretary Harold Brown said that the "Shuttle" can also take aloft "satellite killers" in order to destroy the enemy's spaceships. Also known is the pronouncement of U.S. Air Force Chief of Staff General Lew Allen who said that "the priority of the space shuttle program has now shifted to matters of national defense."

The militarization of the "Shuttle" program, which was once broadly advertised by the U.S. press media as purely peaceful and scientific, is the result of the desire of the American "hawks" to attain military supremacy over the Soviet Union. Possessed by that fixed idea, they are ready to turn outer space into a battlefield.
[41-F]

CSO: 1866

THE PENTAGON'S DANGEROUS PLANS FOR SPACE

Moscow SOVETSKIY VOIN in Russian No 24, 1980 pp 44-45

[Article by P. Plyachenko]

[Text] The Pentagon's plans to use space for aggressive military purposes are not new and unexpected. As far back as the outset of the development of space science and technology, the hawks in the Pentagon began to come forward with cynical declarations that military space equipment is as necessary to insure the military might and superiority of the United States as intercontinental nuclear missiles and strategic bombers.

On the initiative of militarists in the United States, beginning in 1958 a number of large American companies began to study the possibility of building spacecraft for dropping nuclear bombs on targets on the ground. In connection with this, a great deal of attention was given to the development of one of the first orbital aircraft. These were space bombers built as part of the "Dyna Soar" project (the Boeing X-20) that were to be armed with bombs with atomic warheads, nuclear rockets of the "space-to-ground" type, and equipment for conducting espionage from space.

Since that time military space projects have been at the center of attention of the United States' political and military leaders, as well as the sinister American military-industrial complex.

Foreign observers relate the military reorientation of all of American cosmonautics to the Carter administration's tenure in the White House. They talk about the accelerated development of space weapons systems for different purposes. The goal of these plans has been formulated, with cynical frankness, in the American magazine BUSINESS WEEK: "Whoever succeeds in gaining control of space -- the main arena of future wars -- will be able to change the ratio of forces so decisively that it will amount to the establishment of world supremacy." And, as this magazine further reports, right now in the United States there are "tireless" efforts being made to develop new and refined types of weapons that will not only "overturn" the concepts of modern warfare, but will also "turn space into a military camp" that will essentially be a new "theater of war." Such are the Pentagon's dangerous plans and intentions for space.

In connection with this we should also mention the psychological preparation of the populace in the United States, England and other NATO countries that is now being carried out by the militaristic circles in these countries, who have ordered their filmmakers to produce special, highly popular movies about war in space, such as "Star Wars," "The Black Hole," "Superman" and many others. The movie battles in space that are shown in the superhits have much in common with that real war, which will be suicidal for mankind, for which the Pentagon is now coldbloodedly planning and preparing. The creators of these intoxicating space films are trying in every way to extol the Pentagon's strategists and give the weapon merchants hopes of huge profits from the "subjugation of space" by military methods. Together with popular films and magazine articles, these space ambitions have borne practical fruit in the United States in recent years. For instance, in November 1979 President Carter announced a new space program for the United States that provides for the expansion of the Pentagon's plans to use near-earth space in an attempt to gain strategic nuclear rocket supremacy over the Soviet Union.

The Pentagon bosses, inspired by the military-industrial complex, think the time has arrived to carry out the militarization of space with the help of special manned military spacecraft (stations). For this reason, the U.S. Air Force recently accelerated its program for putting these stations into orbit for different periods of time. They are to be used to establish constant and protracted observation of the territory of countries that are potential enemies of the United States, to track all rocket launches, and to determine the location of training grounds, launching areas, airfields, troop billeting areas, naval bases and so on.

In solving the problem of the militarization of space, the Pentagon hawks are giving special attention to the creation of special equipment for the destruction of "foreign" objects in space. In order to do this, they are improving existing and building new manned and unmanned space fighter-interceptors and other equipment. In the United States, the "Gemini" project is now being used as the basis for the development of a manned spacecraft that will be used to identify and destroy foreign objects in space. Besides this, American companies have developed a second manned antisatellite that, according to data published in the magazine AVIATION WEEK AND SPACE TECHNOLOGY, is designed for flight in orbit up to an altitude of 1,600 km, carrying one person and a payload of 450 kg (or a 3-man crew). Finally, work has been done in the United States on the creation of Earth satellite systems in the "Saint" and "Dogleg" programs that will be used to destroy objects in space and ballistic missiles that are in the active part of their trajectory.

Among the programs for the creation of antisatellite weapons, a special place is occupied by a missile built by the Vought Corporation. It is named the MNV (miniaturized homing vehicle) and consists of a cylinder ringed with small rockets. This device is launched from an F-15 airplane that has ascended to an altitude of 20-30 km. Using infrared sensors and an on-board computer, the "missile killer" (as the American press calls it) then begins to search for "targets." A "space mine" is also being developed. It will be sent into orbit near a "foreign" satellite and detonated on command from the ground. Along with this, they are discussing a variant of so-called "blacked out" or "silent" satellites. Devices of this type will be "hidden" deep in space, where they will be "inactive" and, consequently, difficult to detect until they are activated by a command from Earth.

BUSINESS WEEK reports that many scientific and planning institutions are developing space weapon systems using lasers. By the middle of 1980 the Pentagon had spent about 1.5 billion dollars on experimental design projects in this area. The so-called laser and beam weaponry now being developed in the United States is intended (according to the NEW YORK TIMES) to "destroy Soviet ballistic missiles" with "heat" rays and powerful beams of elementary particles.

Despite all this, the Pentagon's most sinister and dangerous project is the introduction into orbit of nuclear charges carried by missiles or satellites. As the magazine AVIATION WEEK AND SPACE TECHNOLOGY recently told its readers, in its intoxication with "stellar war," the Pentagon is studying the question of introducing into a near-Earth orbit more than 100 modified "Minuteman-2" gigantic intercontinental ballistic missiles with nuclear warheads. These essentially new ICBM's, which are named "Minuteman-4," can be controlled from the U.S. Air Force's early warning orbital space stations. In other words, the Pentagon's strategists would like to use near-earth space to keep the entire planet under the Damocle's sword of nuclear death.

Now, as previously, the Pentagon is particularly engrossed in the conduct of space espionage for military purposes. In order to do this, new artificial Earth satellites for reconnaissance purposes are being developed and the old ones are being modernized. The "Big Bird" spy satellites are being used very extensively right now. They carry cameras with different focal lengths and radio, radar and television reconnaissance equipment with technical capabilities that allegedly insure the obtaining of images of the Earth's surface with a resolution that makes it possible to detect and identify interesting objects and targets on the ground and at sea. For example, according to data published in AVIATION WEEK AND SPACE TECHNOLOGY, some of the cameras carried by "Big Bird" have a resolution of 0.3 m, while the width of the hand photographed from an altitude of 160 km is 300 km per pass. The American press reports that the Pentagon is preparing a new generation of spy satellites to replace "Big Bird."

According to BUSINESS WEEK, in the last 20 years Washington has spent more than 50 billion dollars on military space projects. In the budget for the current fiscal year alone, American space expenditures are 8.2 billion dollars, of which a large part is allocated for military purposes.

In talking about the space ambitions of the American hawks, we should, of course, make allowances for their propensity for self-advertisement, as well as their desire for the psychological preparation of the common taxpayer to come up with the money for it and feel that he is doing the right thing.

Thanks to the efforts of the USSR and other peace-loving nations, in the last few decades we have achieved international agreement on the nonintroduction into orbit of objects carrying mass-destruction weapons. Since Washington has wanted to consign to oblivion the obligations that the United States took on from international treaties on the peaceful use of space. The predatory looks that the American military clique are now turning to space are nothing but an attempt to use the greatest achievements of human intelligence to unleash a new thermonuclear war for world supremacy. Using their new space weapons, the malignant people in the Pentagon intend to roll back the pages of history.

Heightened vigilance with respect to the aggressive intrigues of the militaristic circles in the United States and the military cliques of the NATO countries and unity of our peaceloving foreign policy, together with the readiness to give the necessary rebuff to an aggressor, are the starting point of the policy of the CPSU and the Soviet Government in the field of strengthening this country's defensive capabilities.

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LAUNCH TABLE

LIST OF RECENT SOVIET SPACE LAUNCHES

Moscow TASS in English or in Russian various dates

[Summary]

Date	Designation	Orbital Parameters			
		Apogee	Perigee	Period	Inclination
21 Nov 80	Cosmos-1222	659 km	624 km	97.4 min	31.2
27 Nov 80	Soyuz T-3	INITIAL PARAMETERS NOT REPORTED (Manned by Flight Commander Kizim, Flight Engineer Makarov and Cosmonaut-Researcher Strekalov)			
28 Nov 80	Cosmos-1223	40,165 km	614 km	12 hrs 6 min	62.8
1 Dec 80	Cosmos-1224	403 km	209 km	90.3 mim	72.9
5 Dec 80	Cosmos-1225	1,041 km	967 km	105 min	82.9
10 Dec 80	Cosmos-1226	1,025 km	982 km	105 min	83
16 Dec 80	Cosmos-1227	325 km	209 km	89.5 min	72.9
24 Dec 80	Cosmos-1228-35	1,491 km	1,415 km	114.6 min	74
		(Eight satellites launched by a single booster)			
25 Dec 80	Prognoz-8	199,000 km	550 km	95 hrs 23 min	65
		(To study solar corpuscular and EM radiation, near-earth magnetic fields; carries equipment designed in USSR, Poland, Czechoslovakia and Sweden)			
26 Dec 80	Ekran	35,554 km	------	23 hrs 44 min	0.4
		(Communications satellite operating in decimeter range; inserted into circular, near-stationary orbit; international registration index "Statsionar-T")			
26 Dec 80	Cosmos-1236	388 km	180 km	89.8 min	67.1

Date	Designation	Orbital Parameters			
		Apogee	Perigee	Period	Inclination
6 Jan 81	Cosmos-1237	410 km	207 km	90.4 min	72.9
9 Jan 81	Molniya-3	40,784 km	485 km	12 hrs 16 min	62.5
		(Communications satellite for long-distance telephone and telegraph communication and TV broadcasts in the "Orbita" network)			
16 Jan 81	Cosmos-1238	1,976 km	411 km	109.1 min	83
16 Jan 81	Cosmos-1239	265 km	222km	89 min	82.3

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